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INDIANA MICHIGAN POWER

October 27, 2004

AEP:NRC:4054-09
10 CFR 50.54(f)

Docket Nos. 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, D. C. 20555-0001

Donald C. Cook Nuclear Plant Units 1 And 2
NUCLEAR REGULATORY COMMISSION GENERIC LETTER 2004-01
REQUIREMENTS FOR STEAM GENERATOR TUBE INSPECTIONS

Reference: Nuclear Regulatory Commission Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections," dated August 30, 2004.

In Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections," the Nuclear Regulatory Commission (NRC) advised licensees of NRC concerns regarding steam generator (SG) tube inspection practices and compliance with licensee's technical specifications (TS) and 10 CFR Part 50, Appendix B. Because of this concern, the NRC requested that licensees provide a description of their SG tube inspections, including an assessment of whether these inspections ensure compliance with the TS requirements in conjunction with 10 CFR Part 50, Appendix B.

Indiana Michigan Power Company's response to the request is provided in the attachment to this letter.

This letter contains no new commitments. Should you have any questions, please contact Mr. John A. Zwolinski, Safety Assurance Director, at (269) 466-2428.

Sincerely,

Joseph N. Jensen
Site Vice President

Attachment

A115

RV/jen

c: J. L. Caldwell – NRC Region III
K. D. Curry – AEP Ft. Wayne
J. T. King – MPSC
C. F. Lyon – NRC Washington, DC
MDEQ – WHMD/HWRPS
NRC Resident Inspector

AFFIRMATION

I, Joseph N. Jensen, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Joseph N. Jensen
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 27 DAY OF October, 2004

Danielle M. Burgoyne
Notary Public

My Commission Expires Apr. 4, 2008

DANIELLE M. BURGOYNE
Notary Public, State of Michigan
County of Berrien
My Commission Expires Apr. 4, 2008
Acting in the County of Berrien

Attachment to AEP:NRC:4054-09

RESPONSE TO NUCLEAR REGULATORY COMMISSION GENERIC LETTER 2004-01, "REQUIREMENTS FOR STEAM GENERATOR TUBE INSPECTIONS"

In Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections," the Nuclear Regulatory Commission (NRC) advised licensees of NRC concerns regarding steam generator (SG) tube inspection practices and compliance with licensee's technical specifications (TS) and 10 CFR Part 50, Appendix B. Because of this concern, the NRC requested that licensees provide a description of their SG tube inspections, including an assessment of whether these inspections ensure compliance with the TS requirements in conjunction with 10 CFR Part 50, Appendix B.

Indiana Michigan Power Company's (I&M's) response to the request is provided below.

Requested Information 1

Addressees should provide a description of the SG tube inspections performed at their plant during the last inspection. In addition, if they are not using SG tube inspection methods whose capabilities are consistent with the NRC's position, addressees should provide an assessment of how the tube inspections performed at their plant meet the inspection requirements of the TS in conjunction with Criteria IX and XI of 10 CFR Part 50, Appendix B, and corrective action taken in accordance with Appendix B, Criterion XVI. This assessment should also address whether the tube inspection practices are capable of detecting flaws of any type that may potentially be present along the length of the tube required to be inspected and that may exceed the applicable tube repair criteria.

Response to 1

Unit 1

SG tube inspections performed at Donald C. Cook Nuclear Plant (CNP) Unit 1 use techniques that are consistent with the NRC's position that existing requirements (TS in conjunction with 10 CFR Part 50, Appendix B) require licensees to employ inspection techniques capable of detecting all flaw types which may be present at locations that are required to be inspected by the TS. A discussion of the Unit 1 SG design, the TS requirements, and the examinations that have been performed is provided below.

Unit 1 has replacement Babcock and Wilcox SGs. These SGs were placed in service in December of 2000. Each of the replacement SGs contains alloy 690 thermally treated (TT) tubes manufactured by Sumitomo Metal Industries of Japan. The U-bend of all tubes having up to a 12-inch centerline bend radius (rows 1-13) is stress relieved. In addition, the low-row U-bend tubes have an increased bend radius such that they are inspectable by a qualified bobbin coil probe. As such, Unit 1 has no non-stress relieved low-row U-bend tubes. The tubes are fully hydraulically expanded into the tubesheet.

Unit 1 is currently in its third cycle of operation since installation of the replacement SGs. Inspections were conducted at the conclusion of both the first and second cycles as required by the TS. At the time of the last inspection, the inspection interval was governed by TS 4.4.5.3.a, which requires that the SGs be inspected at an interval of not less than 12 nor more then 24 calendar months after the previous inspection, and TS Table 4.4-1, which requires that a minimum of one SG be inspected during the second and subsequent inservice inspections. TS Table 4.4-2 defines the minimum number of tubes per SG to be examined (12 percent divided by the number of SGs inspected). The examination extent as defined by TS 4.4.5.4.a.8 is from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg.

The last inspection was conducted in October – November 2003, during the Unit 1 Cycle 19 (U1C19) refueling outage. The U1C19 SG inspection scope was developed to exceed the minimum TS requirements. During the U1C19 refueling outage, I&M performed the following tube inspections in one SG:

- Full length (tube end–to-tube end) examination of 20 percent of the SG tubes with a bobbin coil.
- Special interest rotating coil examinations in areas of interest reported during the bobbin coil examination as noted below:
    - Examination of (20 percent planned, 100 percent actual) reported dent/ding indications that were considered to be relevant.
    - Examination of (20 percent planned, 70 percent actual) reported freespan indications that were considered to be relevant.

In accordance with industry practices, I&M used the degradation assessment process to determine the type and location of flaws for which the tubes may be susceptible. Based upon this assessment, which considers SG design features, plant specific operational and inspection history and industry inspection history from similar SGs, the inspection scope, method, and locations to be examined were determined. An eddy current technique validation assessment was performed prior to the inspection to confirm that the eddy current techniques to be used were capable of detecting those flaw types identified in the degradation assessment.

Full–length bobbin coil examinations were conducted on the noted tubing population in accordance with the TS and industry guidelines to monitor the general condition of the tubing. No degradation was found during these inspections.

Sample rotating coil inspections were performed using qualified techniques to inspect the bobbin coil indications of special interest as identified above in order to better characterize the bobbin coil results and to ensure the indications were not masking degradation. The degradation assessment did not identify the potential for degradation in these types of indications; however, a sample inspection program was enacted to monitor the indications and confirm the degradation assessment predictions. No degradation was found during these inspections.

The results of the Unit 1 inspections were provided to the NRC in CNP's 2003 annual operating report, letter AEP:NRC:4961, dated March 1, 2004.

Unit 2

SG tube inspections performed at CNP Unit 2 use techniques that are consistent with the NRC's position that existing requirements (TS in conjunction with 10 CFR Part 50, Appendix B) require licensees to employ inspection techniques capable of detecting all flaw types which may be present at locations that are required to be inspected by the TS. A discussion of the Unit 2 SG design, the TS requirements, and the examinations that have been performed is provided below.

Unit 2 has replacement Westinghouse SGs. These SGs were placed in service in 1989. Each of the replacement SGs contains alloy 690 TT tubes manufactured by Sandvik of Sweden. All tubes in the eight innermost rows were thermally stress relieved after bending. In addition, the entire tube bundle has an increased tube bend radius, which further reduces the residual stress in the U-bend area. With the exception of seven tubes that lack hydraulic expansion in either the hot or cold leg tubesheet due to a manufacturing oversight, the tubes are fully hydraulically expanded into the tubesheet.

As a result of previous favorable inspection results, the Unit 2 inspection interval is governed by TS 4.4.5.3.a, which requires that the SGs be inspected at least once during each 40 month interval. TS Table 4.4-1 requires that a minimum of one SG be examined during these inservice inspections. TS Table 4.4-2 defines the minimum number of tubes per SG to be examined (12 percent divided by the number of SGs inspected). The examination extent as defined by TS 4.4.5.4.a.8 is from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg.

Unit 2 recently completed its eighth cycle of operation since installation of the replacement SGs. The last inspection was performed in October, 2004, during the Unit 2 Cycle 15 (U2C15) refueling outage. The SG inspection scope for U2C15 was developed to exceed the minimum TS requirements. During the U2C15 refueling outage, I&M performed the following tube inspections:

- Full length examination of 25 percent of the SG tubes (except Row 1 and Row 2 U-bends) with a bobbin coil – All SGs.
- Examination of 20 percent of the hot leg expansion transitions, plus or minus 3 inches with a rotating coil - Two SGs.
- Examination of 20 percent of inservice small radius (Row 1 and Row 2) U-bends with a rotating coil – One SG.
- Special interest rotating coil examinations in areas of interest reported during the bobbin coil examination as noted below:

- Examination of 20 percent (minimum) of reported dent/ding indications that were considered to be relevant.
- Examination of 20 percent (minimum) of reported freespan indications that were considered to be relevant.
- Examination of 100 percent of the tubesheet region of all reported non-hydraulically expanded tubes.
- Examination of 100 percent of the previous hot leg tubesheet bulge indications that were in the planned bobbin coil inspection population.
- Examination of 100 percent of the reported possible loose part indications and associated bounding tubes.

As described in the Unit 1 response, I&M utilizes the degradation assessment process to determine the type and location of flaws to which the tubes may be susceptible. Note that due to the additional inservice time of the Unit 2 SGs and the corresponding time dependent examination requirements of industry guidelines, the Unit 2 inspection scope is typically more extensive than the Unit 1 inspection scope. Similar to that of Unit 1, an eddy current technique validation assessment is performed prior to the inspection to confirm that the eddy current techniques to be used are capable of detecting those flaw types identified in the degradation assessment.

Based upon the U2C15 degradation assessment, full-length bobbin coil examinations were conducted on the noted tubing population in accordance with the TS and industry guidelines to monitor the general condition of the tubing. This inspection identified minor support plate and foreign object induced wear on a total of three tubes. As a result, one tube was classified as degraded and conservatively plugged. No other degradation was found during the inspection.

Sample rotating coil examinations were conducted using qualified eddy current techniques to inspect the top of the hot leg tubesheet (plus or minus 3 inches) on two SGs. The inspection extent above the tubesheet was selected to bound the section of tube within the sludge pile. The inspection extent below the top of the tubesheet was selected to bound the expansion transition and the tube-to-tubesheet crevice. While the degradation assessment did not forecast potential degradation in this area, it was targeted to meet industry guidelines. No degradation was found during these inspections.

Sample rotating coil inspections were also conducted using qualified eddy current techniques to inspect the low row U-bend area of one SG. While the degradation assessment did not forecast degradation in this area, due to the SG design features, i.e., alloy 690 thermally treated tubing, stress relieved tubing, increased bend radius, and the lack of any previous degradation from industry inspections, a monitoring inspection was considered to be prudent given the inservice time of the units. No degradation was found during these inspections.

Sample rotating coil inspections were also performed on bobbin coil indications of special interest as noted above, using qualified eddy current techniques to better characterize the bobbin coil results and/or to ensure the indications were not masking degradation. The degradation assessment did not identify the potential for corrosion related degradation in these types of indications; however, a sample inspection program was enacted to monitor the indications and confirm the degradation assessment predictions. With the exception of the foreign object wear indication that was discussed earlier and which was also examined with a rotating coil as part of the special interest population, no additional degradation was found during these inspections.

Requested Information 2

If addressees conclude that full compliance with the TS in conjunction with Criteria IX, XI and XVI of 10 CFR Part 50, Appendix B, requires corrective actions, they should discuss their proposed corrective actions (e.g., changing inspection practices consistent with the NRC's position or submitting a TS amendment request with the associated safety basis for limiting the inspections) to achieve full compliance. If addressees choose to change their TS, the staff has included in the attachment suggested changes to the TS definitions for a tube inspection and for plugging limits to show what may be acceptable to the staff in cases where the tubes are expanded for the full depth of the tubesheet and where the extent of the inspection in the tubesheet region is limited.

Response to 2

SG tube inspections performed at CNP Unit 1 and Unit 2 are consistent with the NRC's position regarding tube inspections. Therefore, this request is not applicable to CNP.

Requested Information 3

For plants where SG tube inspections have not been or are not being performed consistent with the NRC's position on the requirements in the TS in conjunction with Criteria IX, XI, and XVI of 10 CFR Part 50, Appendix B, the licensee should submit a safety assessment (i.e., a justification for continued operation based on maintaining tube structural and leakage integrity) that addresses any differences between the licensee's inspection practices and those called for by the NRC's position. Safety assessments should be submitted for all areas of the tube required to be inspected by the TS where flaws have the potential to exist and inspection techniques capable of detecting these flaws are not being used, and should include the basis for not employing such inspection techniques. The assessment should include an evaluation of (1) whether the inspection practices rely on an acceptance standard (e.g., cracks located at least a minimum distance of x below the top of the tube sheet, even if these cracks cause complete severance of the tube) which is different from the TS acceptance standards (i.e., the tube plugging limits or repair criteria), and (2) whether the safety assessment constitutes a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the joint. If the safety assessment constitutes a change to the method of evaluation under

10 CFR 50.59, the licensee should determine whether a license amendment is necessary pursuant to that regulation.

Response to 3

SG tube inspections performed at CNP Unit 1 and Unit 2 are consistent with the NRC's position regarding tube inspections. Therefore, this request is not applicable to CNP.